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[54] FORMING MACHINE FOR BENDING METAL STRIPS

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[51] **Int. Cl.**⁶ **B21D 5/08**

[52] **U.S. Cl.** **72/181**

[58] **Field of Search** 72/181, 180, 182, 178, 72/176, 226, 238

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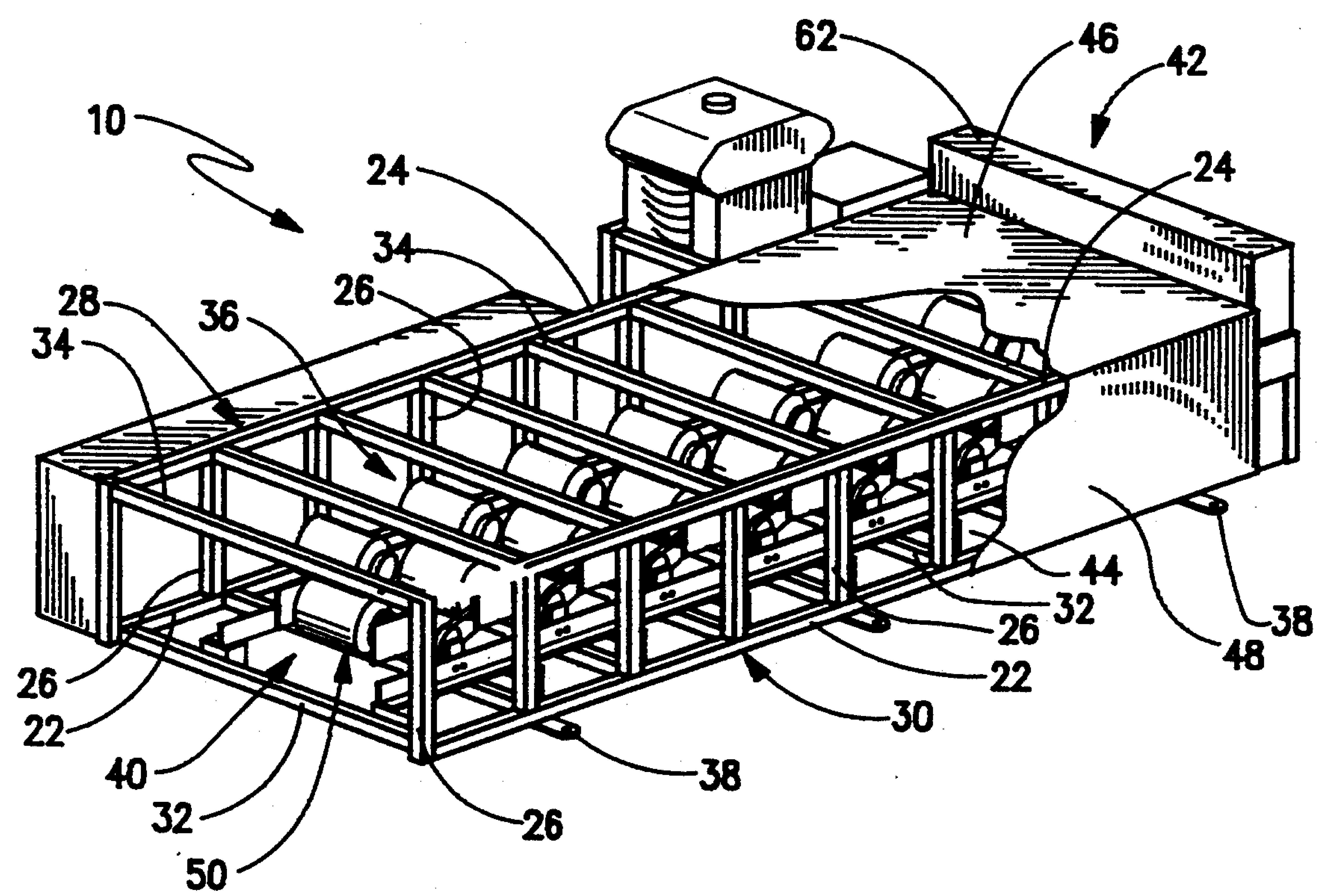
Attorney, Agent, or Firm—Timothy J. Martin

[57] **ABSTRACT**

A metal forming machine is adapted to bend flat strips of metal into a desired profile. The machine has a rigid framework that forms a cage in which a drive mechanism is disposed to advance a strip therethrough. An elongated rail structure is secured within the cage's interior and is removable out of one of the entrance or exit of the framework. Preferably, the rail structure is mounted at selected discrete mounting locations spaced laterally of the drive mechanism. A plurality of forming elements are disposed on the rail structure to define at least two longitudinally spaced forming stations, and the forming stations act to bend the strip into the desired profile. The rail structure may be removed from the framework without detaching the mounting stations. A plurality of rail structures may be employed with some of the rail structures formed by a plurality of longitudinally aligned rail sections at least one of which carries a plurality of forming stations. Alternative sets of rail structures may be interchangeably mounted in the framework as forming sets to allow formation of different profiles without individually changing each forming station. Mounting blocks may adjustably interconnect the rail structures to the framework. The drive mechanism can incorporate a plurality of pairs of coacting rollers, and a shear mechanism may cut the formed strip at desired lengths.

23 Claims, 7 Drawing Sheets



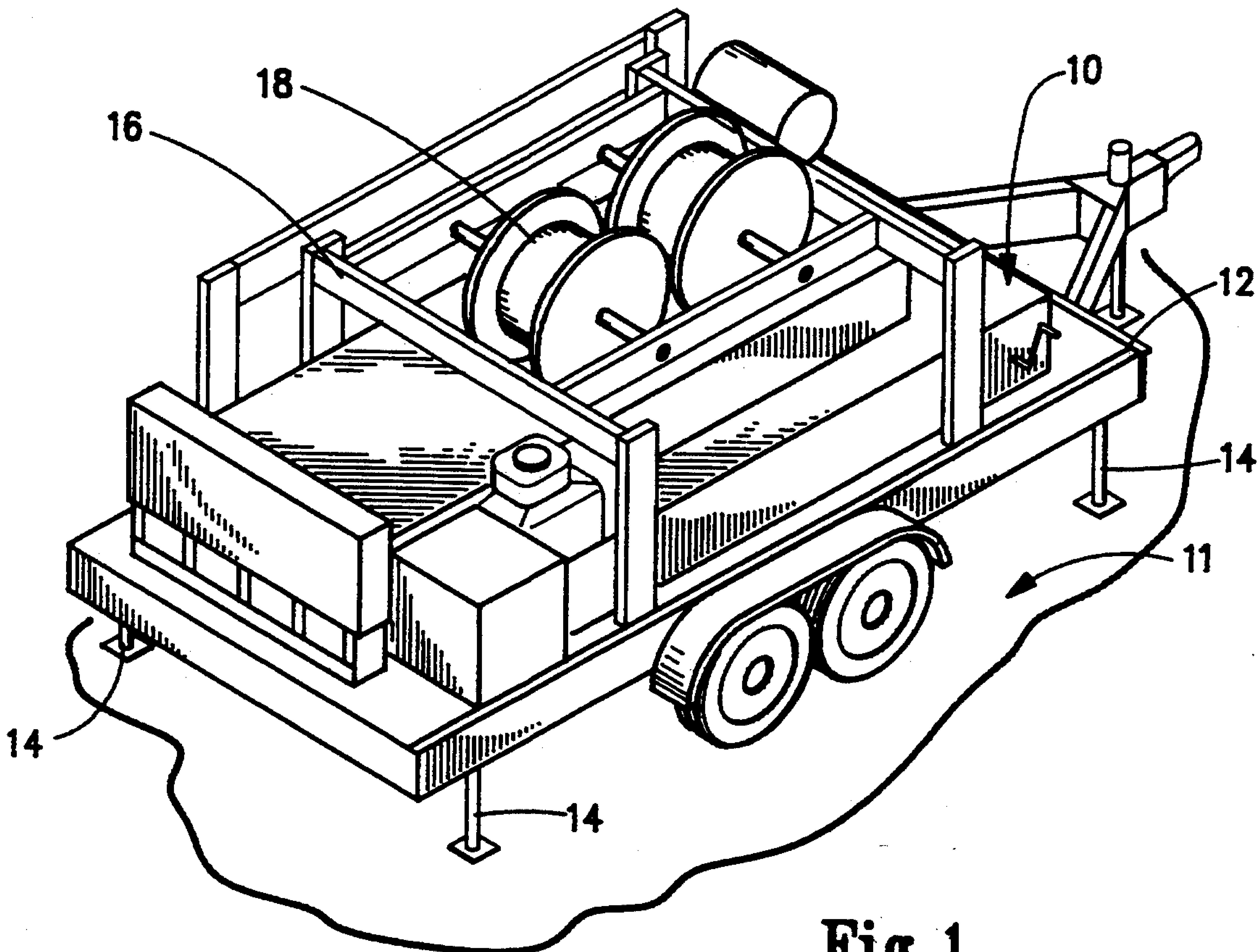


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Fig.1

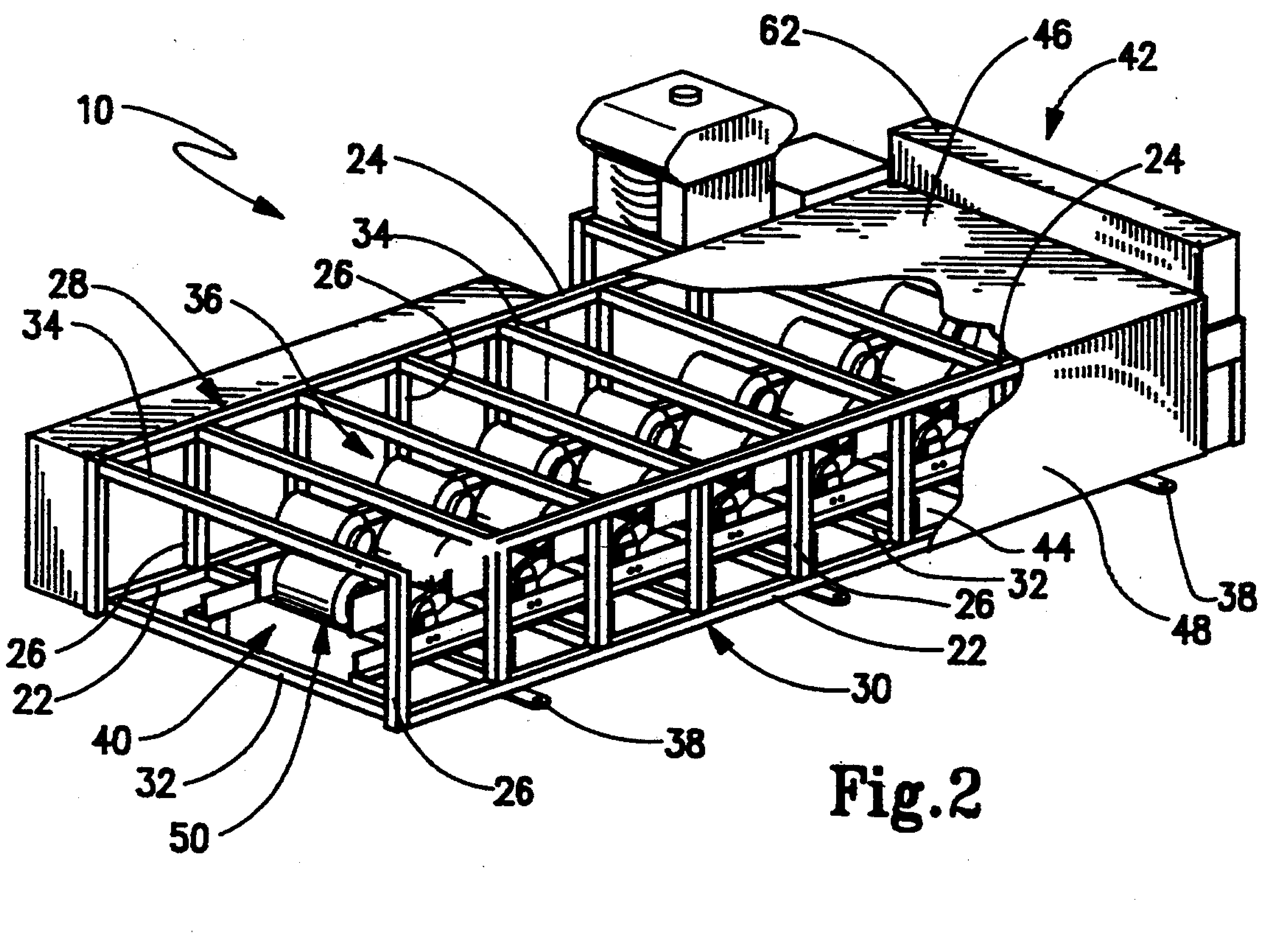

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Fig.2

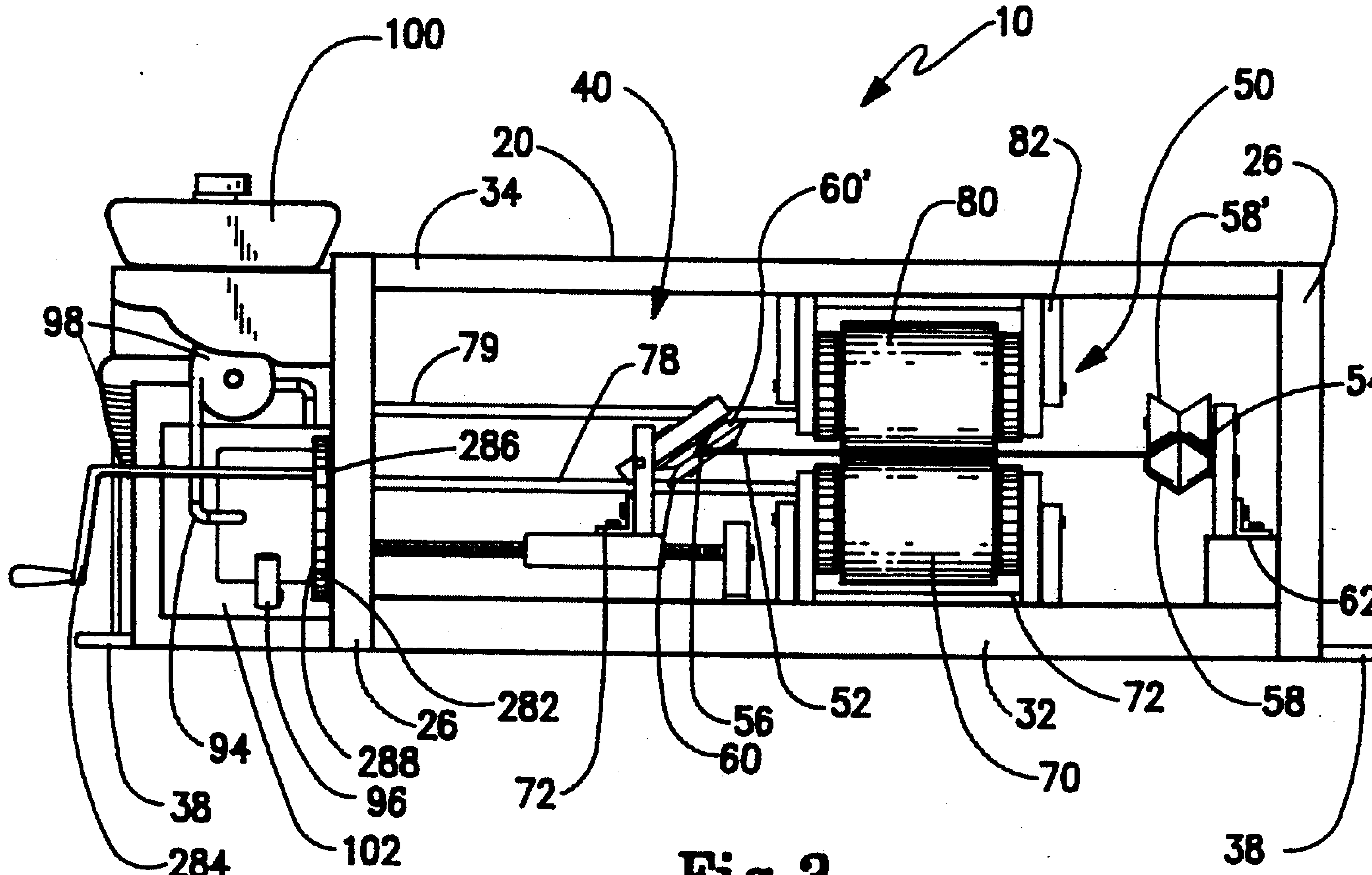
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Fig.3

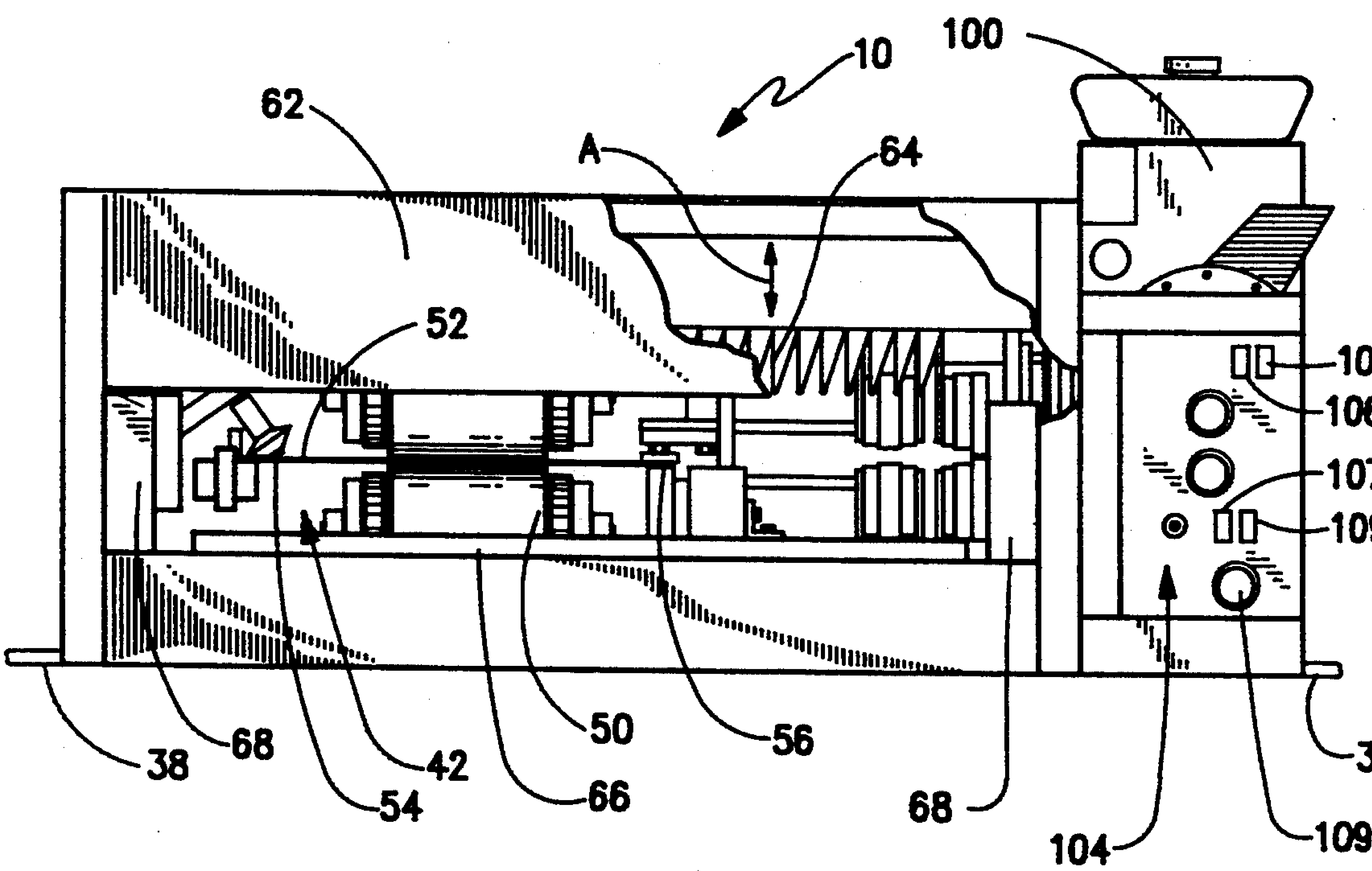
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Fig.4

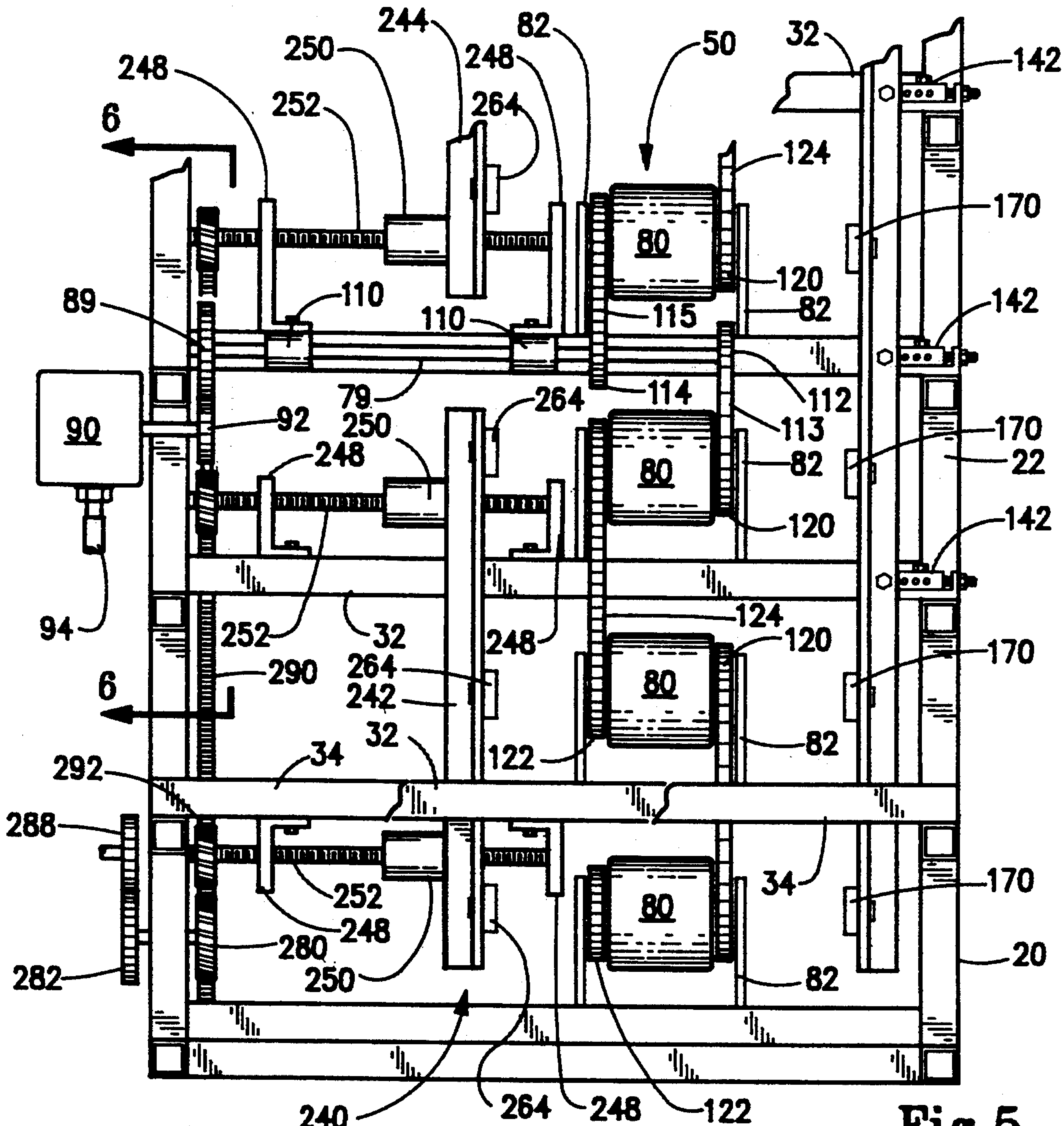

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Fig.5

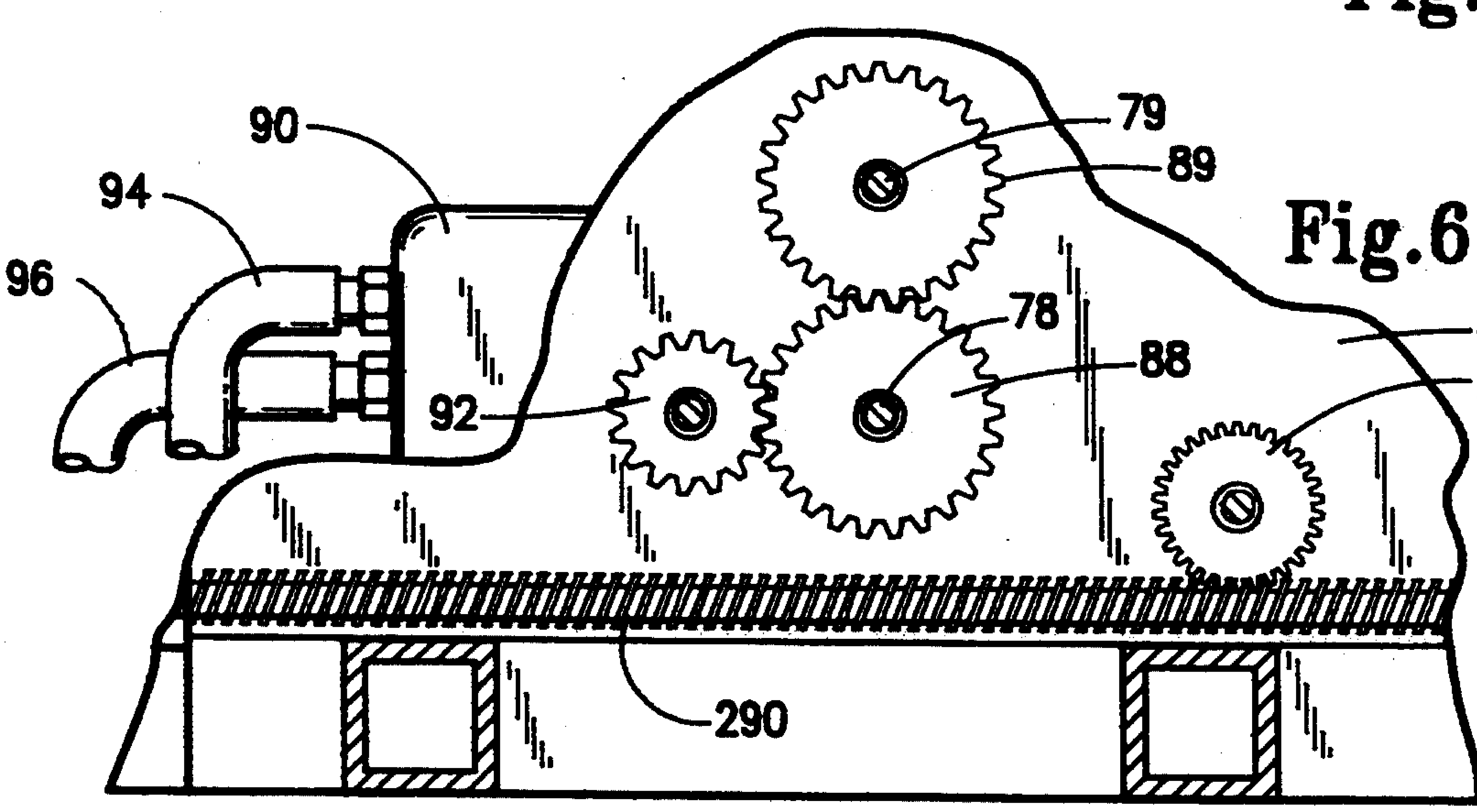

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Fig.6

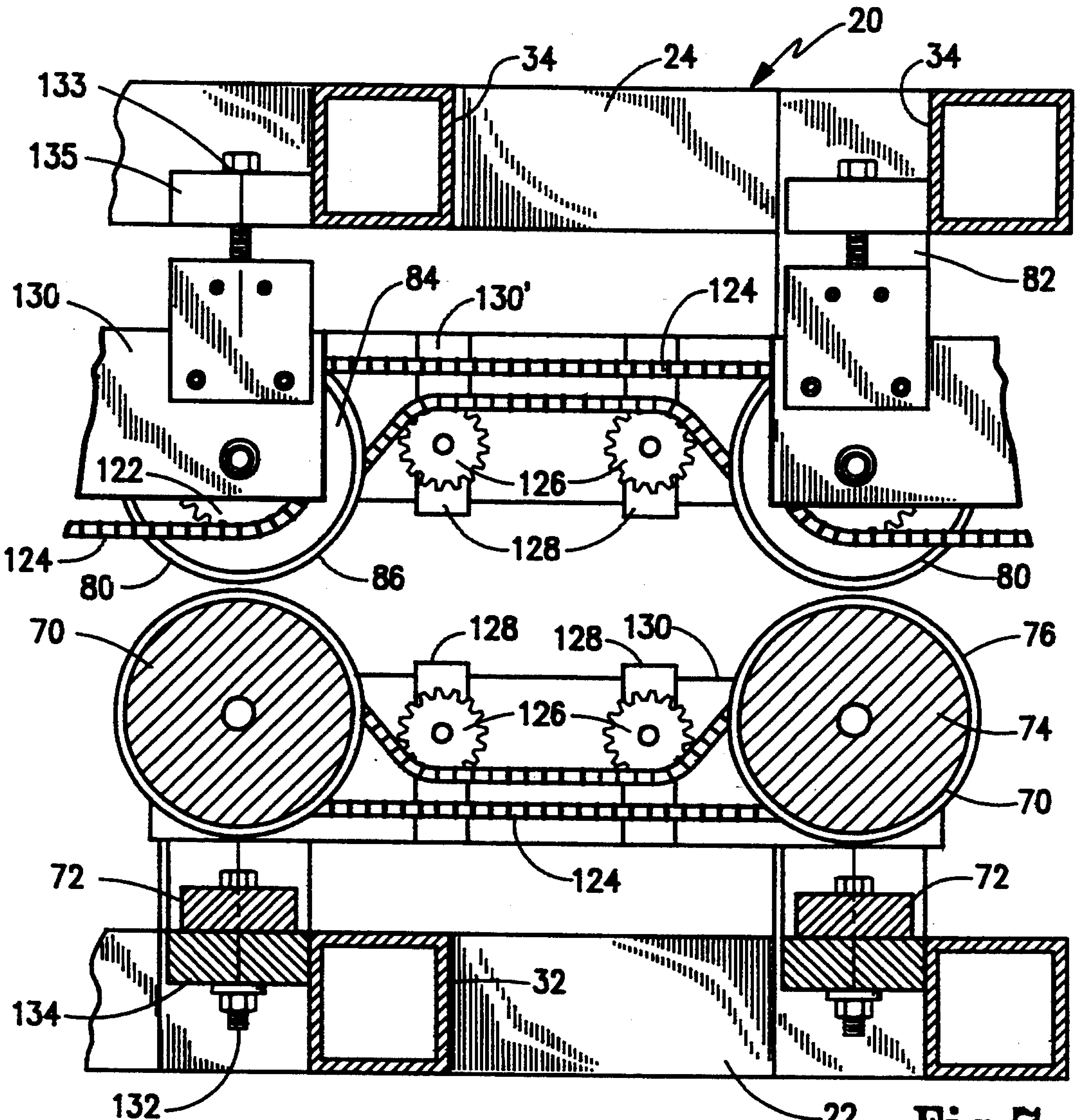

Fig.7

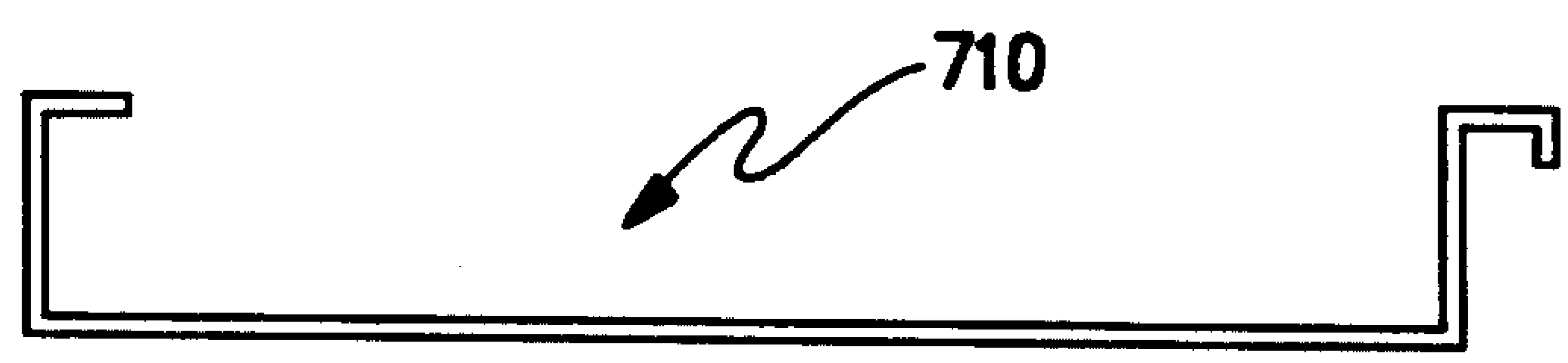

Fig.13a

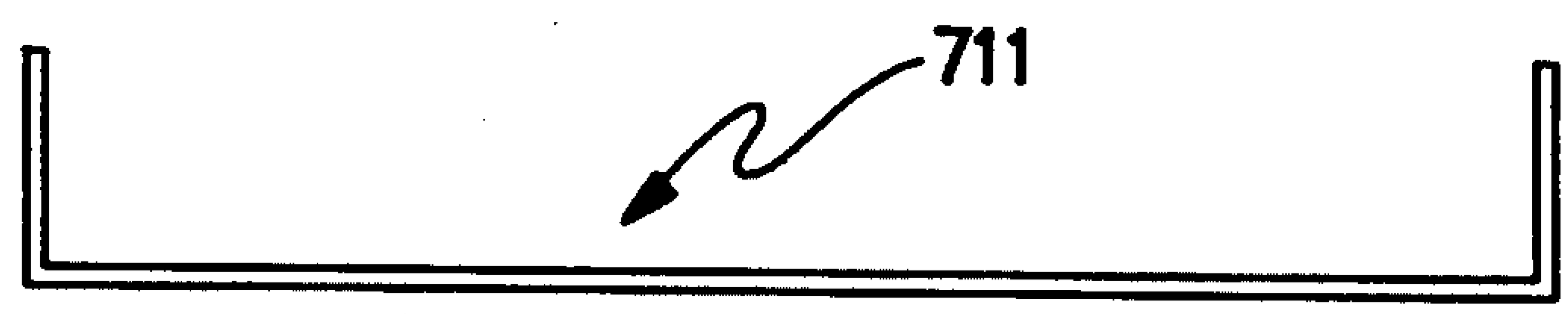

Fig.13b

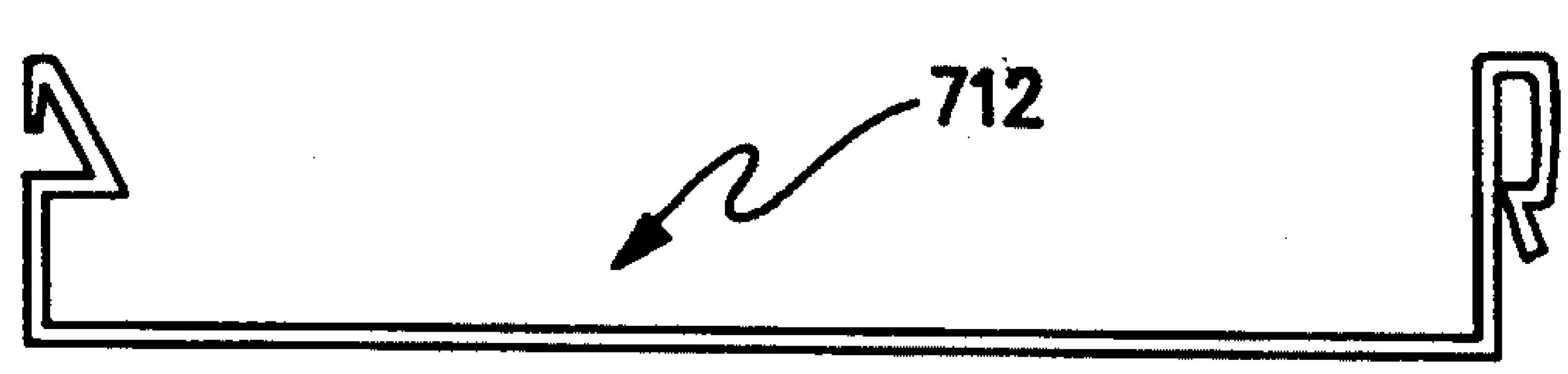

Fig.13c

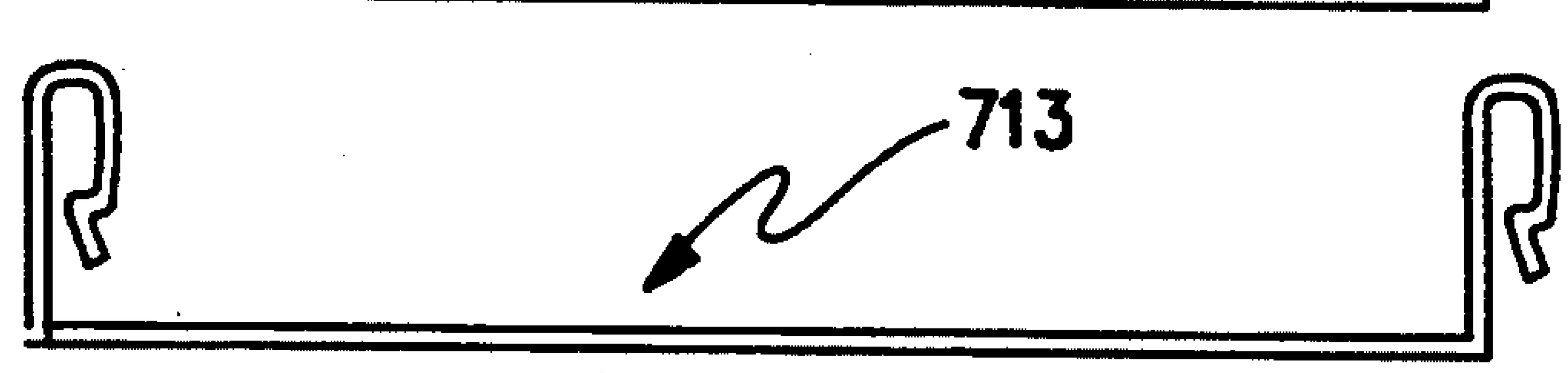

Fig.13d

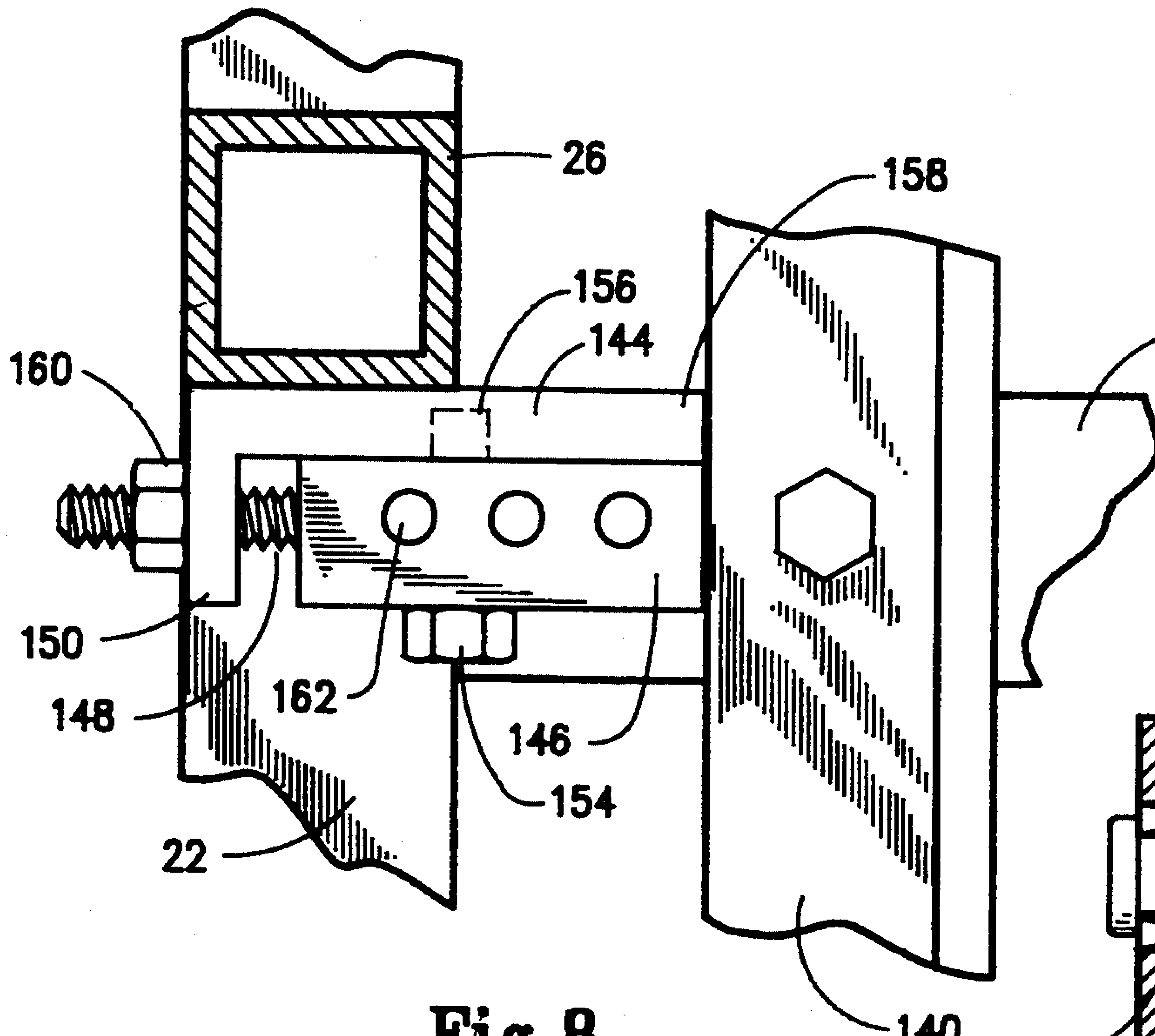
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Fig.8

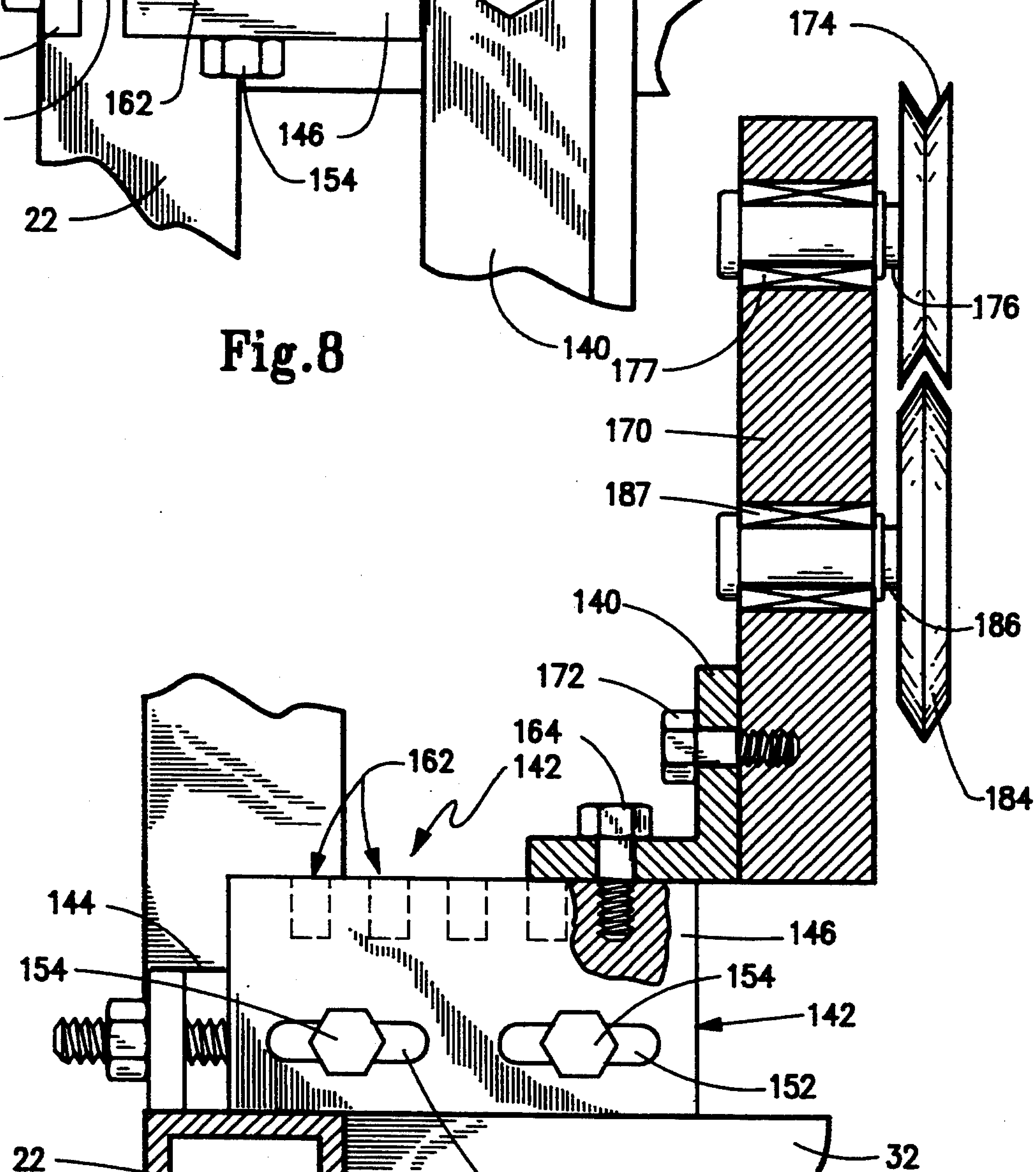
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Fig.9

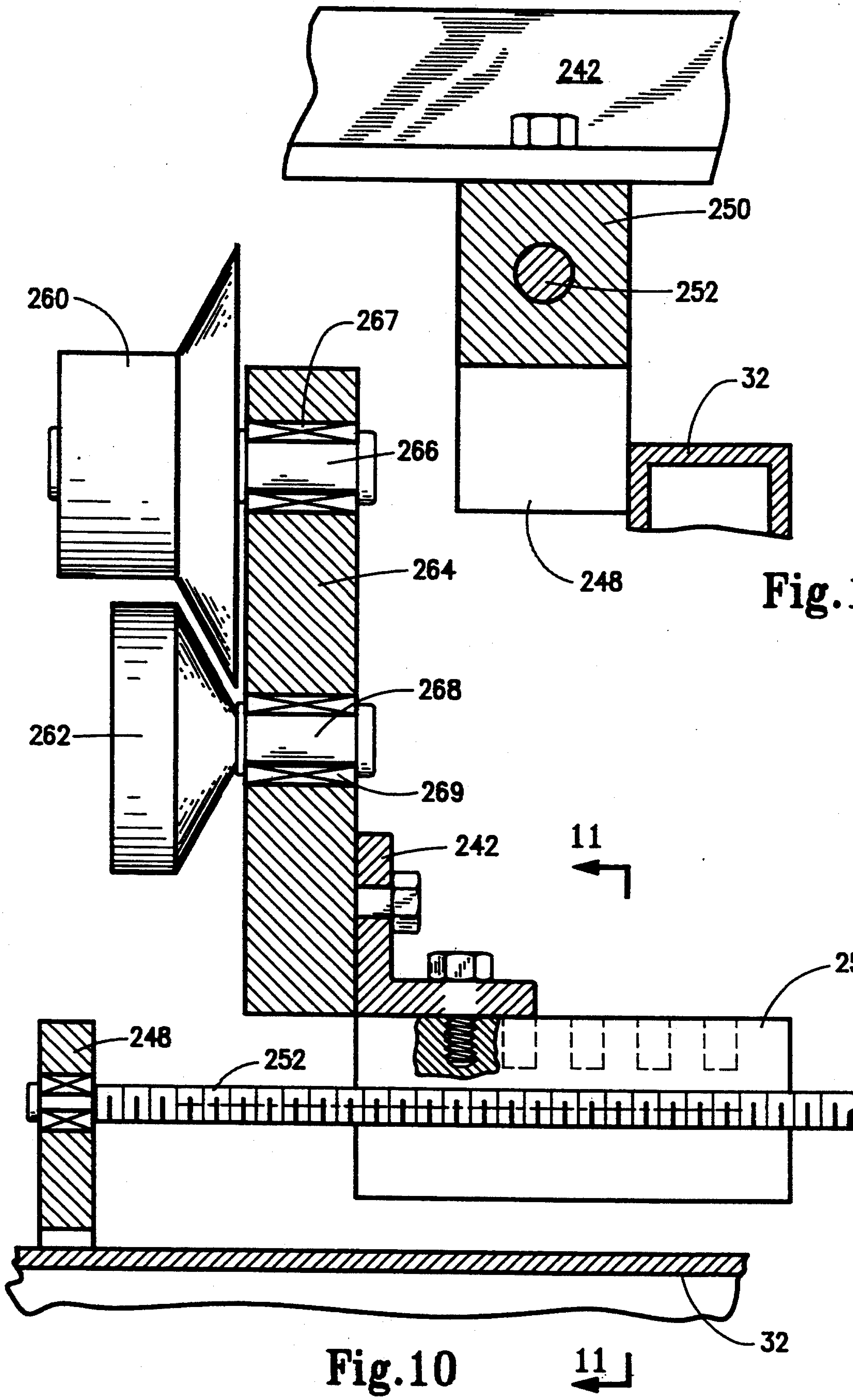
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Fig.11

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Fig.10

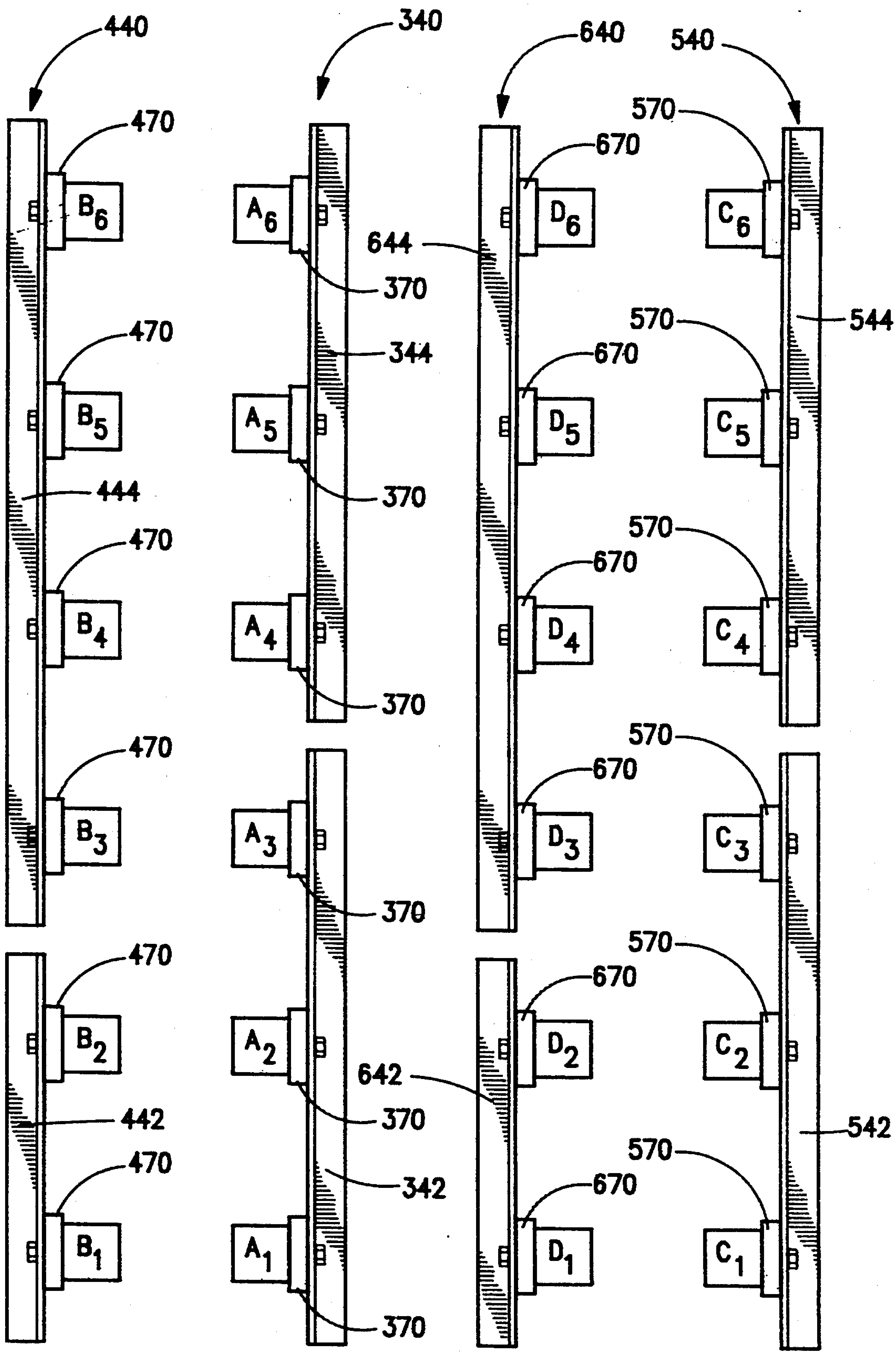

Fig.12a

Fig.12b

FORMING MACHINE FOR BENDING METAL STRIPS

FIELD OF THE INVENTION

The present invention generally relates to metal forming machines, but more particularly relates to metal forming machines wherein a strip of metal is advanced through the machine against metal forming elements which progressively shape the strip of metal into a desired cross-sectional configuration. The field of this invention specifically concerns improvements to the mounting structure used to secure the forming elements within the machine so that different sets of forming elements may be interchanged to configure various profiles.

BACKGROUND OF THE INVENTION

Metal fabricating machines occupy a significant role in modern industry and include, for example, machines which stamp, roll, form, cut and extrude metal, to name a few. One such type of a machine, and a type to which the present invention is directed, receives an elongated strip of metal at an entryway, advances the strip of metal progressively through the machine and against the laterally positioned forming elements to configure the longitudinal margins of the strip into desired useful cross-sections after which the strip is discharged at an exit location. The metal strips fed into such a machine may either be discreet lengths of metal or, as is more typically the case, a continuous feed is provided from a coil, and the formed strip is cut into usable lengths at the exit location. Specific examples of such machines for which the present invention is particularly useful include gutter, roof panel and siding panel forming machines.

Existing panel forming machines have a framework structure which houses a drive system for advancing the strip of metal therethrough and machined forming elements are disposed to configure the longitudinal margins of the strip. Normally in these machines, the profile forming elements are each independently mounted to the framework at selected locations so that the longitudinal margin of the strip is progressively bent into a desired profile. While these existing machines are quite useful and effective in fabricating metal strips into panels and gutters, each machine typically can only form a single profile so that a fabricator must acquire a separate machine for each profile desired to be configured. Alternately, the entire set of forming elements may be replaced by individually detaching each forming element; thus, it is possible to produce a different profile. Naturally, this procedure is very time consuming and costly to the fabricator. Since a variety of different profiles are desired by various purchasers, interchanging the elements on an individual basis is not suitable so that the fabricator again reverts to the purchase of a variety of machines.

Even where individual forming elements are replaced, the fabricator still is constrained to produce panels of a set width since the forming elements are each attached to discrete positions. Thus, where a fabricator wishes to manufacturer custom widths, or a variety of standard widths, additional machines must be acquired or extensive modifications must be made to an existing machine. Neither of these solutions is desirable

from the fabricator's standpoint both for monetary costs and time considerations.

Accordingly, prior to the present invention, there was an unresolved need for improvements to metal fabricating machines of a type to form profiles and strips of materials. One area of need was to have a more universal machine which could replace a variety of other machines each specially designed to create a specific profile in a metal strip. Another need was to provide fabricators the ability to change panel widths having desired longitudinal edge profiles with a minimum effort and down time for the forming machine. There was a further need for a metal forming machine that was enhanced in this versatility without adding inordinately to the capital cost of the machine.

SUMMARY OF THE PRESENT INVENTION

It is an object of the present invention to provide a new and useful metal forming machine specifically adapted for creating profiles one or more of the longitudinal margins of a strip of metal.

It is a further object of the present invention to provide a metal forming machine wherein different sets of forming elements may be inserted and removed from the machine as a single unit or as groups whereby different profiles may be fabricated onto a longitudinal edge margin of a metal strip.

Yet another object of the present invention is to provide a metal forming machine which can bend opposite longitudinal margins of a strip of metal into desired profiles separated by width that is easily adjustable whereby different panel widths may be produced with the same family of forming elements.

Still a further object of the present invention is to provide a new and improved mounting structure for the forming elements of a metal forming machine which provides adjustable positioning of the forming elements as a set.

A further object of the present invention is to provide a metal forming machine which may be easily transported to on-site locations.

According to the broad form of the present invention, a metal forming machine is provided to bend a longitudinally margin of a flat strip of metal into a desired profile. The strip of metal may either be a selected length strip or a continuous strip that is fed into the machine and severed at desired lengths. In either event, the broad form of the present invention employs a rigid framework which extends about a forming region through which the flat strip may be advanced from an upstream entrance to a downstream exit. A drive mechanism is disposed in the forming region and mounted to the framework so that the drive mechanism can engage the flat strip and advance the strip in the downstream direction. An elongated rail structure is adapted to be removably secured in the mounted state to the framework in the forming region so that it is located alongside the drive mechanism and spaced a selected lateral distance therefrom. Forming elements are secured to the elongated rail structure and define at least two forming stations located in longitudinally spaced relation to one another. These forming stations are positioned to receive the longitudinal margin of the flat strip when the rail structure is in the mounted state so that the forming stations are operative to bend the longitudinal margin into the desired profile. The rail structure is detachable from the framework so as to remove all of the forming stations secured thereto without detachment of the forming stations from the rail structure itself. With this configuration, alternative rail structures may be separately mounted within the framework with these alternative rail structures having different forming stations thus allowing fabrication of different profiles with the same basic machine.

Due to weight considerations, it is preferred that the rail structure is formed of at least two rail sections which may be longitudinally aligned with one another. In this case, each rail section has at least some of the forming stations therein and at least one of the rail sections has at least two of the forming stations. Further according to the preferred embodiment of the present invention, the rail structure is mounted for lateral adjustment of position to vary the width between the rail structure and the drive mechanism thereby allowing variation of the width of the formed panel having the desired profile.

Preferably, first and second rail structures are provided with there being rail structure on either side of the drive mechanism so that both of the opposite longitudinal margins of the strip of metal may be simultaneously configured into a selected profile. In this case, it is preferred that each of the rail structures includes a plurality of mounting stations secured thereto so that one set of mounting stations may be interchanged with another set of mounting stations by simply removing each of the rail structures. In this configuration, it is desired that both of the rail structures be adjustable laterally so that the width of the fabricated panel may be selectively varied. Again, one or both of the rail structures may be constructed as a plurality of rail sections.

While the improvement in the rail structure carrying the forming elements may be implemented with a variety of drive mechanisms and framework mechanisms for existing metal forming machines, in the preferred embodiment of the present invention, the drive mechanism includes a plurality of pairs of coacting rollers disposed in the forming region at spaced locations from one another. Here, each pair of coacting rollers operates to frictionally engage opposite surfaces of the flat strip of metal with a gripping force such that counter-rotation of the pair of coacting rollers advances the flat strip in the downstream direction. A drive linkage accordingly interconnects these pairs of coacting rollers for corresponding rotational movement, and adjusting screws are provided so that the gripping force may be selectively varied in magnitude. Further, in order to power the machine, it is preferred that the power source be in the form of a hydraulic drive coupled to a combustive engine with the combustive engine driving a hydraulic pump connected to a reservoir of fluid. The pump in turn powers a hydraulic motor that in turn powers the drive mechanism to advance the metal strip through the forming region past the forming elements. Where a continuous feed is provided, a shearing mechanism is disposed proximately to the exit and is operative when activated to transversely cut the strip of metal after the profile is formed to produce a formed piece having a selected length.

These and other objects of the present invention will become more readily appreciated and understood from a consideration of the following detailed description of the preferred embodiment when taken together with the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a rear view in perspective showing the metal forming machine according to an exemplary embodiment of the present invention showing the metal forming machine mounted on a trailer for transport;

FIG. **2** is a front view in perspective, partially broken away, showing the metal forming machine of FIG. **1**;

FIG. **3** is a front view in elevation, partially broken away, showing the metal forming machine of FIGS. **1** and **2**;

FIG. **4** is a rear view in elevation, partially broken away, showing the metal forming machine of FIGS. **1** and **2**;

FIG. **5** is a top plan view, partially broken away, showing the framework, drive mechanism and rail structure of the metal forming machine shown in FIGS. **1–4**;

FIG. **6** is a side view, in partial cross-section, taken about lines **6—6** of FIG. **5**;

FIG. **7** is a side view, in partial cross-section, showing a portion of the drive mechanism used for the exemplary metal forming machine of FIGS. **1–4**;

FIG. **8** is a top plan view of the mounting block structure for a first rail structure for the metal forming machine of FIGS. **1–4**;

FIG. **9** is an end view, in partial cross-section, showing the first rail mounting structure of FIG. **8** along with an exemplary pair of forming elements;

FIG. **10** is a rear view in elevation, in partial cross-section, showing the mounting structure for a second rail structure for the metal forming machine of FIGS. **1–4** along with a second pair of metal forming elements;

FIG. **11** is a cross-sectional view taken about lines **11—11** of FIG. **10**;

FIGS. **12**(*a*) and **12**(*b*) show alternate rail structures for use with the metal forming machine of FIGS. **1–4**; and

FIGS. **13**(*a*) through **13**(*d*) show representative panel profiles which may be configured by forming elements mounted in the metal forming machine of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is directed to a metal forming machine specifically adapted to bend one or both of the longitudinal margins of a flat strip of metal into a desired profile. While the present invention may be employed with elongated strips of metal sheet cut to discreet lengths, it is contemplated that the present invention may be primarily used with a continuous feed structure wherein formed strips having a desired longitudinal profile are cut out of a continuous strip of material fed into the forming machine. Specifically, the present invention is constructed to receive a variety of different sets of metal forming elements mounted as sets on rail structures so that the different sets may be easily interchanged to allow fabrication of different panel profiles. To this end, it should be understood that the phrase "panel" when used in the context of a formed strip can include, for example, a standing seam panel, siding, guttering, structural or non-structural framing members and the like, as would be understood by the ordinarily skilled person in this metal forming art.

The metal forming machine according to the exemplary embodiment of the present invention is best shown, in its broad structure, in FIGS. **1–4**. In FIG. **1**, it may be seen that metal forming machine **10** is adapted to be mounted onto a trailer structure **12** which may be towed to an on-site location and positioned on surface **11** and stabilized thereto by means of stabilizing lifts **14**. Trailer **12** is provided with a spool frame **16** which shows a pair of spools **18** mounted for rotation thereon. Spools **18** are adapted to receive coils of sheet metal which may be fed into metal forming machine **10**, as described more thoroughly below.

As is shown in FIGS. **2–4**, metal forming machine **10** is in the form of a rigid framework **20** formed by a pair of lower longitudinal members **22** and a pair of upper longitudinal members **24** which are rigidly interconnected to lower longitudinal members **22** by a plurality of vertical members **26** to form side frames **28** and **30** on the left and right sides of metal forming machine **10**, respectively. Side frames **28** and **30** are rigidly interconnected to one another by lower transverse members **32** and upper transverse members **34** so that framework **20** forms a rigid cage which extends around a generally longitudinal forming region **36** through which a strip of metal to be formed may be passed, and framework **20** includes a plurality of ears **38** so that framework **20**, and thus forming machine **10**, may be rigidly attached to trailer **12**. Each of members **22**, **24**, **26**, **32** and **34** are preferably tubular steel of square-shape cross-section. Forming region **36** defines an entrance **40** and an exit **42** and is surrounded by bottom panel **44**, top panel **46** and side panels **48**, all of which are attached, such as by screws, to framework **20** so as to enclose forming region **36** other than at entrance **40** and exit **42**.

A drive mechanism **50** is disposed in forming region **36** in order to advance the strip of metal in a downstream direction from entrance **40** to exit **42**. Drive mechanism **50** is mounted to framework **20**, as described below, and is operative to engage a flat strip, such as strip **52** shown in FIGS. **3** and **4**, in order to advance the strip through forming region **36**. As is shown in FIGS. **3** and **4**, metal strip **52** has opposite longitudinal margins **54** and **56** which are to be formed by forming elements. To this end, a plurality of forming elements, such as forming elements **58**, **58'** and **60**, **60'**, are organized into forming stations that are disposed in forming region **36**. These forming elements are respectively secured to first and second rail structures **140** and **240**, by suitable mounts, also as described more thoroughly below. A shearing mechanism **62** is provided at exit **42** in order to sever strip **52** into desired sections after the marginal profiles are formed thereon. Shearing assembly **62** is of a type well-known in the art as guillotine and is hydraulically actuated by hydraulic cylinders **68**. Activation of shearing assembly **62** reciprocates knives **64** in the direction of arrow "A" against base block **66**.

As is shown best in FIGS. **2–7**, drive mechanism **50** is formed by a plurality of pairs of coacting rollers which counter-rotate in order to advance the strip of metal through the forming region **36**. Here, a lower roller **70** and upper roller **80** which are respectively secured to transverse members **32** and **34** by bracket assemblies **72** and **82**. Rollers **70** each has a central metal core **74** surrounded by a rubber-like gripping material **76** to increase the frictional engagement of roller **70** with metal strip **52**. Likewise, each roller **80** includes a central metal core **84** surrounded by a rubber-like surface **86**. Drive mechanism **50** is powered by rotating drive rods **78** and **79** which are driven by way of a hydraulic motor **90** acting through drive gear **92** which engages gear **88** secured to drive rod **78**. Gear **88** engages another gear **89** so that, upon rotation of drive gear **92**, gears **88** and **89** counter-rotate thereby counter-rotating drive rods **78** and **79** in corresponding directions. Hydraulic motor **90** is driven by hydraulic fluid which circulates through entry conduit **94** and exit conduit **96**. Hydraulic fluid is pumped by means of pump **98** which is powered by gasoline engine **100**. Pump **98** circulates hydraulic fluid out of a reservoir **102** and through the hydraulic motor **90** so that the fluid returns to reservoir **92**, as best shown in FIGS. **3** and **6**. Furthermore, as is best shown in FIG. **4**, a control panel **104** is provided which includes start and stop buttons **105**, **106** for hydraulic motor **90** and activate and deactivate buttons **107**, **108** for cutting assembly **62**. An emergency stop button **109** is also provided to deactivate all operation of metal forming machine **10** in case of emergencies.

With reference to FIG. **5**, it may be seen that rotation of drive rods **78** and **79** operate to counter-rotate rollers **70** and **80**. To this end, for example, drive rod **79** is supported by bearings **110** mounted to framework **20** and include a pair of drive gears **112**, **114** which engage primary drive chains **113** and **115**, respectively. Thus, as is shown in FIG. **5**, primary drive chain **113** drives upper roller **80** ' by way of drive gear **120**. Drive chain **115** drives upper roller **80** by way of gear drive **122**. Transfer drive chains **124** transfer this rotary motion between adjacent ones of rollers **70** and **80** by driveably interconnecting gears **120** and **122**, respectively, as is best shown in FIG. **7**. In this figure, it may be seen that interconnecting drive chains **124** may be tensioned by idler gears **126** rotatably journaled on brackets **128** which are in turn secured to connecting plates **130**, **131** ' which interconnect adjacent ones of roller pairs **70** and **80**. Connecting plates **130**, **131** ' are mounted by brackets **72** and **82**. Lower plate **130** is rigidly mounted to lower frame member **32** through block **134** by bolt **132**. Upper plate **130** ' is supported by adjusting bolt **133** mounted through block **135** secured to upper transverse frame members **34**. This allows the gripping force between a pair of rollers **70**, **80** to be adjustably varied.

From the foregoing description, it may be appreciated that each pair of rollers **70** and **80** may be positioned for different thicknesses of metal strips by adjusting bolts **132** and **133** which moves brackets **172** and **182** away from and toward one another. After properly positioning rollers **70** and **80**, the tension of interconnecting drive chains **124** may be adjusted by adjustably positioning idler bracket **128** so that idler gears **126** take up the slack in chains **124**.

An important feature of the present invention resides in the mounting of the forming elements which operate to bend the longitudinal margins of a strip of metal passing through drive mechanism **50** into a selected profile. Contrary to the teachings of prior art structures, the present invention employs elongated rail structures to mount the forming elements in sets so that a plurality of forming stations are located on the guide rails and so that these forming stations may be secured within framework **20** as sets without requiring each individual forming element to be independently mounted. Thus, as is seen in FIG. **5**, a first rail structure **140** is mounted to framework **20** by means of slide mounting blocks **142**, best shown in FIGS. **8** and **9**, and a second rail structure **240** is mounted to framework **20** by means of rods **252**, slide blocks **250** and channel pieces **246**, best shown in FIGS. **10** and **11**.

In FIGS. **8** and **9**, it may be seen that mounting blocks **142** include an L-shaped arm **144** having legs **150** and

158. Arm **144** is rigidly secured to lower transverse member **132** and lower longitudinal member **22** and a slide plate **146** carries a threaded rod **148** which is received through a bore in the leg **150** of arm **144**. Slide plate **146** is provided with a pair of slots **152** which receive bolts **154** that are threadably received in bores **156** of leg **158**. Nut **160** is received on rod **148** so that slide plate **146** may be relatively moved with respect to L-shaped arm **144** by loosening bolts **154** and by adjusting nut **160**. Bolts **154** are then tightened to lock plate **146** to arm **144**. Slide plate **146** includes a plurality of threaded openings **162** which then receive bolts **164** that mount first rail structure **140** to slide plate **146**. Accordingly, rail structure **140**, which is preferred to be in the shape of an angle iron, may be secured in a desired bore **162** for lateral adjustment at discrete intervals after which slide plate **146** may be adjusted relative to arm **144** providing infinite adjustment for the position of rail structure **140** within the range of openings **162** and **152**.

Rail structure **140** mounts rigid plates **170** by means of bolts **172**, and plates **170** rotatably receive forming elements, such as forming elements **174** and **184** respectively on axles **176** and **186** journaled in bearings **177** and **187**. Accordingly, each plate **170** and its associated forming elements defines a single forming station through which the longitudinal margin of sheet **52** may be driven thereby to bend the margin into a desired profile. With reference again to FIG. **2**, it may be seen that a plurality of forming stations defined by plates **170** are secured to a single rail **140**.

A second rail structure **240** is shown in FIG. **5** and includes first and second rail sections **242** and **244**. Each of sections **242** and **244** are slidably mounted with respect to framework **20**. To this end, each of rail sections **242** and **244** has its ends mounted to a traveling block **250** which is threadably received on a threaded drive rod **252**. Each of rods **252**, in turn, are rotatably journaled between mounting blocks **248** that are rigidly attached to lower transverse frame members **32**. This mounting structure is further shown in FIGS. **10** and **11**, and it may be readily be appreciated that, as rods **252** are rotated, the travel blocks **250** are driven transversely to the downstream direction and carry with them the second guide rail structure **240**, as defined by rail pieces **242** and **244** and, correspondingly, the forming elements secured thereto. Thus, for example, as is shown in FIG. **10**, forming elements **260** and **262** are secured to rail section **242** by means of a mounting plate **264** and axles **266** and **268**. Axles **266** and **268** are respectively received in bearings **267** and **269** mounted through plate **264**.

In order to rotate each of rods **252** so that each slide block **250** is correspondingly driven, a bevel drive gear **280** is provided that is driven by shaft **282** that may be operated by hand crank **284** shown in FIG. **3** which turns drive gear **286** that rotates transfer gear **288**. With reference again to FIGS. **5** and **6**, it may be seen that drive gear **280** rotates spiral threaded rod **290**; rod **290** in turn operates a bevel drive gear **292** connected to each of rods **252**. Accordingly, when crank **284** is rotated, each traveling block **250** is slid back and forth a common distance.

With reference to FIGS. **12**(*a*) and **12**(*b*), it should be appreciated that each rail structure carries a plurality of forming stations mounted thereon and that alternative rail structures may be interchanged to provide different forming stations whereby different edge profiles may be fabricated. For example, as is shown in FIG. **12**(*a*), a first rail structure **340** includes a first rail section **342** and a second rail section **344** which may be longitudinally aligned with one another. Rail section **342** carries forming stations A1–A3 on respective mounting blocks **370** while rail section **344** carries forming stations A4–A6 on mounting blocks **370**. Removal of rail sections **342** and **344** would allow removal all of forming stations A1–A6 without removing the forming stations from the respective rail section. Similarly, second rail structure **440**, shown in FIG. **12**(*a*), is formed of two rail sections **442** and **444**. Rail section **442** carries a pair of forming stations B1 and B2 respectively mounted on plates **470** while rail section **444** carries a plurality of forming stations B3–B6 on mounting plates **470**. Again, removal of each of rail sections **442** and **444** allows removal of all of forming stations B1–B6 from the forming region. Likewise in FIG. **12**(*b*), first rail structure **540** has aligned rail sections **542** and **544** which respectively mount forming stations C1–C3 and C4–C6; second rail structure **640** has aligned rail sections **642** and **644** which mount forming stations D1–D2 and D3–D6, respectively, on plates **570** and **670**.

It should now be appreciated with the structure described above, alternative sets of forming elements may be removed from the forming machine **10** without detaching the respective pairs of forming elements that define the forming stations from the respective rails. Therefore, a fabricator may fabricate different profiles by using different sets of first and second rail structures without the need to use a different forming machine. That is, the various forming elements that define the forming stations may be inserted and removed from the machine as easily mounted sets without removing those forming elements from their respective rails. Since the attachment of each rail is accomplished by simply bolting the rail to its respective mounting block, such as mounting blocks **146** and slide blocks **150**, very little time is necessary to complete this process.

With reference to FIGS. **13**(*a*)–**13**(*d*), a variety of known profiles **710**, **711**, **712** and **713** are shown which can be manufactured by a single machine simply by exchanging the rail structures. To this end, the ordinarily skilled engineer in this field can design the forming elements to create these and other profiles. It should further be understood that the width of each of these profiles may be changed merely by turning crank **284** to expand or contract the relative distance between the first and second rail structures.

Accordingly, the present invention has been described with some degree of particularity directed to the preferred embodiment of the present invention. It should be appreciated, though, that the present invention is defined by the following claims construed in light of the prior art so that modifications or changes may be made to the preferred embodiment of the present invention without departing from the inventive concepts contained herein.

We claim:

1. A metal forming machine adapted to bend a longitudinal margin of a flat strip of metal into a desired profile, comprising:

(a) a rigid framework having side frames rigidly interconnected to one another by transverse members to form a rigid cage having an interior; said cage extending about a forming region through which said flat strip may be advanced from an upstream entrance to a downstream exit;

(b) a drive mechanism disposed in the interior of said rigid cage in the forming region and mounted to said framework, said drive mechanism operative to engage said flat strip and advance said flat strip in a downstream direction from said entrance to said exit;

(c) an elongated rail structure adapted to be removably secured within the interior of said cage in a mounted state to said framework in the forming region thereof at discrete first mounting locations whereby said first rail structure may be secured at selected discrete locations spaced a selected lateral distance from said drive mechanism; and

(d) a plurality of forming elements secured to said rail structure to define at least two forming stations located in a longitudinally spaced relation to one another along said rail structure, said forming stations positioned to receive said longitudinal margin when said rail structure is in the mounted state whereby said forming stations are operative to bend said longitudinal margin into the desired profile as said flat strip is advanced through the forming region by said drive mechanism, said rail structure being detachable from said framework and removable from the forming region without detachment of said forming stations therefrom.

2. A metal forming machine according to claim 1 wherein said rail structure is formed as at least two rail sections, each said rail section having at least some of said forming elements secured thereto such that at least one of said rail sections has a plurality of forming stations located thereon and other ones of said rail sections have at least one first forming station located thereon.

3. A metal forming machine according to claim 2 wherein said rail sections are longitudinally aligned with one another.

4. A metal forming machine according to claim 1 wherein said rail structure is adjustably secured with respect to said framework whereby the lateral distance between said drive mechanism and said rail structure may be selectively varied.

5. A metal forming machine according to claim 4 wherein said rail structure has opposite first rail ends and including means for adjusting the lateral distance between said rail structure and said drive mechanism by moving said rail structure as a unit such that the opposite ends are commonly advanced toward and retracted away from said drive mechanism.

6. A metal forming machine according to claim 1 including mounting blocks interconnecting said framework and said rail structure, each said mounting blocks having a plurality of mounting locations at which said rail structure may be secured whereby the lateral distance between rail structure and said drive mechanism may be discreetly adjusted.

7. A metal forming machine according to claim 6 wherein each said mounting block is adjustably connected to said framework whereby the lateral distance between said rail structure and said drive mechanism may be continuously adjusted over a selected range.

8. A metal forming machine according to claim 1 including a shearing mechanism disposed proximately to said exit and operative when activated to transversely cut said strip of metal after said profile is formed to produce a formed piece having a selected length.

9. A metal forming machine according to claim 1 wherein said drive mechanism includes a plurality of pairs of coacting rollers disposed in the forming region at spaced locations from one another, each pair of coacting rollers operative to frictionally engage opposite surfaces of said flat strip with a gripping force whereby counter rotation of said pair of coacting rollers advances said flat strip in the downstream direction.

10. A metal forming machine according to claim 9 including drive linkage driveably interconnecting each pair of coacting rollers for corresponding rotational movement.

11. A metal forming machine according to claim 9 wherein said gripping force may be adjustably varied in magnitude.

12. A metal forming machine according to claim 1 including a power source operative to power said drive mechanism.

13. A metal forming machine according to claim 12 including a source of hydraulic fluid, a pump, and a hydraulic motor and wherein said power source is a combustive engine whereby said engine powers said hydraulic pump which in turn powers said hydraulic motor that powers said drive mechanism.

14. A metal forming machine according to claim 1 including a plurality of alternative rail structures each of which may be selectively secured to and detached from said framework, each said alternative rail structure having forming elements organized to provide at least two forming stations thereon, each of said alternative rail structures having forming elements different from others of said alternative rail structures whereby said alternative rail structures may be interchanged to permit fabrication of selected different profiles.

15. A metal forming machine adapted to bend opposite first and second longitudinal margins of a flat strip of metal to form a panel piece having a desired profile, comprising:

(a) a rigid framework extending about a forming region through which said flat strip may be advanced from an upstream entrance to a downstream exit;

(b) a drive mechanism disposed in the forming region and mounted to said framework, said drive mechanism operative to engage said flat strip and advance said flat strip in a downstream direction from said entrance to said exit;

(c) an elongated first rail structure adapted to be removably secured in a mounted state to said framework in the forming region thereof alongside said drive mechanism on a first side thereof by first mounting blocks interconnecting said framework and said first rail structure, each said first mounting block having a plurality of first discrete mounting locations whereby said first rail structure may be secured at selected first lateral distance from said drive mechanism;

(d) an elongated second rail structure adapted to be removably secured in a mounted state to said framework in the forming region thereof alongside a second side thereof side drive mechanism and on a second side thereof by second mounting blocks each said second mounting block having a plurality of second discrete mounting locations whereby said second rail structure may be secured at a selected second lateral distance from said drive mechanism;

(e) a plurality of first forming elements secured to said first rail structure and organized to provide at least two first forming stations located in a longitudinally spaced relation to one another along said first rail structure, said first forming stations positioned to receive a first longitudinal margin of said strip when said first rail structure is in the mounted state whereby said first forming stations are operative to bend said longitudinal margin into a first desired edge profile as said flat strip is advanced through the forming region by said drive mechanism, said first rail structure being detachable from said framework and removable from the forming region without detachment of said first forming stations therefrom; and

(f) a plurality of second forming elements secured to said second rail structure and organized to provide at least two second forming stations located in a longitudinally spaced relation to one another along said second rail structure, said second forming stations positioned to receive a second longitudinal margin of said strip when said second rail structure is in the mounted state whereby said second forming stations are operative to bend said longitudinal margin into a second desired edge profile as said flat strip is advanced through the forming region by said drive mechanism, said second rail structure being detachable from said framework and removable from the forming region without detachment of said second forming stations therefrom.

16. A metal forming machine according to claim **15** wherein each said first mounting block is adjustably connected to said framework whereby the lateral distance between said first rail structure and said drive mechanism may be continuously adjusted over a selected range.

17. A metal forming machine according to claim **15** wherein said second rail structure is adjustably secured with respect to said framework whereby the second lateral distance between said drive mechanism and said second rail structure may be selectively varied.

18. A metal forming machine according to claim **17** wherein said second rail structure has opposite second rail ends and including means for adjusting the second lateral distance between said first rail structure and said drive mechanism by moving said second rail structure as a unit such that the opposite second rail ends are commonly advanced toward and retracted away from said drive mechanism.

19. A metal forming machine according to claim **18** wherein said means for adjusting the second lateral distance includes a threaded rod disposed transversely in said forming region and a traveling block slidably supported on each said threaded rod for reciprocal movement therealong and a drive assembly operative to move each of said traveling blocks in conjunction with one another whereby said slide blocks are subjected to common reciprocal movement, said second rails being secured to said traveling blocks.

20. A metal forming machine according to claim **15** wherein each of said first and second rail structures is formed of at least two rail sections, such that said first rail structure has a plurality of first rail sections each having at least some of said first forming elements secured thereto and such that said second rail structure has a plurality of second rail sections each having at least some of said second forming elements secured thereto whereby at least one of said first rail sections has a plurality of first forming stations located thereon and whereby at least one of said second rail sections has a plurality of second forming stations located thereon.

21. A metal forming machine according to claim **15** wherein at least one of said first and second rail structures is formed as at least two rail sections, each said rail section having at least some of the respective said first and second forming elements secured thereto such that at least one of said rail sections has a plurality of forming stations located thereon and other ones of said rail sections have at least one forming station located thereon.

22. A metal forming machine according to claims **21** wherein said first rail sections are longitudinally aligned with one another and wherein said second rail sections are longitudinally aligned with one another when in the mounted state.

23. A metal forming machine adapted to bend a longitudinal margin of a flat strip of metal into a desired profile, comprising:

(a) a rigid framework having side frames rigidly interconnected to one another by transverse members to form a rigid cage surrounding an interior extending about a forming region through which said flat strip may be advanced from an upstream entrance to a downstream exit;

(b) a drive mechanism disposed in the forming region interiorly of said rigid cage and mounted to said framework, said drive mechanism operative to engage opposite surfaces of said flat strip and advance said flat strip in a downstream direction from said entrance to said exit;

(c) an elongated rail structure adapted to be removably secured in a mounted state to said framework in the forming region interiorly of said rigid cage alongside said drive mechanism and spaced a selected lateral distance therefrom; and

(d) a plurality of forming elements secured to said first rail structure to define at least two forming stations each comprising at least a pair of said forming elements, said forming stations located in a longitudinally spaced relation to one another along said rail structure and positioned to receive said longitudinal margin when said rail structure is in the mounted state whereby said forming stations are operative to bend said longitudinal margin into the desired profile while maintaining a flat central portion of said flat strip of metal as said flat strip is advanced through the forming region by said drive mechanism, said rail structure being demountable from said framework and removable from the forming region out of one of said entrance and said exit without detachment of said forming stations therefrom.

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